III. CLAIM AMENDMENTS

1. (Currently amended) A method for encoding a digital image~~,~~ in ~~which method the digital image is divided into blocks (C, L, U, UL, UR),~~ a block-based manner, ~~characterized in that~~ ~~in the method~~ in which a spatial prediction for a block ~~(C)~~ is performed to reduce ~~the~~an amount of information to be transmitted, wherein ~~at least one prediction method (P1 P13) is defined,~~ the method comprises:

- ~~a classification is determined for at least one~~examining pixel values of a neighbouring block ~~(L, U)~~ of ~~said~~ a block ~~(C)~~ to be predicted to determine a classification for the neighbouring block according to the image contents of said neighbouring block ~~(L, U),~~; ~~and~~
- selecting a prediction method ~~(P1 P13) is selected~~ for the ~~current~~ block ~~(C)~~to be predicted on the basis of ~~at least one~~ said classification; and
- forming a spatial prediction for the block to be predicted using the selected prediction method.

2. (Currently amended) A method according to Claim 1, ~~characterized in that~~wherein the classification for a neighbouring block is determined on the basis of directionality in the ~~information~~image contents of the neighbouring block.

3. (Currently amended) A method according to Claim 2, ~~characterized in that~~wherein the directionality ~~information~~in the image contents of the neighbouring block is determined by calculating at least one gradient value (g_k) on the basis of pixel values of ~~said~~the neighbouring block.

4. (Currently amended) A method according to Claim 3, ~~characterized in that~~wherein ~~the~~ gradient values (g_k) are calculated with the following formula:

$$g_0 = \frac{1}{N(N-1)} \max\left(1, \sum_{y=0}^{N-1}\sum_{x=0}^{N-2}\left|I(x,y) - I(x+1,y)\right|\right)$$

$$g_1 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=1}^{N-1}\left|I(x,y) - \tfrac{1}{2}\left(I(x-1,y) + I(x-1,y+1)\right)\right|\right)$$

$$g_2 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=1}^{N-1}\left|I(x,y) - I(x-1,y+1)\right|\right)$$

$$g_3 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=1}^{N-1}\left|I(x,y) - \tfrac{1}{2}\left(I(x-1,y+1) + I(x,y+1)\right)\right|\right)$$

$$g_4 = \frac{1}{N(N-1)} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-1}\left|I(x,y) - I(x,y+1)\right|\right)$$

$$g_5 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-2}\left|I(x,y) - \tfrac{1}{2}\left(I(x,y+1) + I(x+1,y+1)\right)\right|\right)$$

$$g_6 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-2}\left|I(x,y) - I(x+1,y+1)\right|\right)$$

$$g_7 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-2}\left|I(x,y) - \tfrac{1}{2}\left(I(x+1,y) + I(x+1,y+1)\right)\right|\right) \quad (1)$$

where N is the size of the neighbouring block, I(x,y) represents ~~the~~ pixel intensity values, indices x and y refer to coordinates of a pixel inside the neighbouring block, and k represents edge orientations.

5. (Currently amended) A method according to Claim 4, ~~characterized in that~~wherein at least eight directionality classes ~~(D0 – D7)~~ are defined for different edge orientations.

6. (Currently amended) A method according to Claim ~~1~~5, ~~characterized in that~~wherein the classification comprises a further 3 non-directional classes ~~(D8 – D10)~~ corresponding to flat, smooth texture and coarse texture blocks.

7. (Currently amended) A method according to Claim 1, ~~characterized in that in the method~~further comprising defining at least two context classes ~~(C0 – C6) are defined, therein~~and performing a mapping phase ~~is performed, in~~ which the classification ~~information (D8 – D10)~~ for a neighbouring block is mapped into one of said context classes ~~(C0 – C6)~~.

8. (Currently amended) A method according to Claim 1, ~~characterized in that in the method~~comprising:

- determining a classification ~~is determined~~ for at least two neighbouring blocks ~~(L, U)~~ of said block ~~(C)~~ to be predicted according to the image contents of said neighbouring blocks ~~(L, U),~~;
- defining context classes ~~(C0 – C6) are defined~~ for said neighbouring blocks ~~(L, U),~~; and
- selecting a prediction method ~~(P1-P13) is selected~~ for the ~~current~~ block ~~(C)~~to be predicted on the basis of a combination of the defined context classes ~~(C0 – C6)~~.

9. (Currently amended) A method according to Claim 1, ~~characterized in that in the method~~comprising defining a cost function ~~is defined, wherein the selection of the~~and selecting a prediction method for the block to be predicted ~~comprises the steps of~~by:

- calc~~u~~lating a value of the cost function for at least two prediction methods~~,~~;
- ~~exploring~~examining the calculated cost function values to find~~ing~~ the minimum value~~,~~; and
- selecting the prediction method which produces said minimum value for the cost function.

10. (Currently amended) A method according to Claim 9, ~~characterized in that~~wherein the cost function is defined as:

$Cx = D + \lambda R,$

where cost Cx is defined as a weighted sum of distortion D and rate R associated with each of the prediction methods and λ is the weighting factor.

11. (Currently amended) A method according to Claim 1, ~~characterized in that in the method~~further comprising:

- defining a prediction error ~~is defined~~ on the basis of ~~the~~a predicted~~ion~~ formed for the block to be predicted and the ~~real pixel values of said block (C) to be predicted, and that;~~

- coding the prediction error information ~~is coded,~~; and

- transmitting the coded prediction error information ~~is transmitted~~.

12. (Currently amended) A device for encoding a digital image~~, which is divided into blocks (C, L, U, UL, UR)~~, in a block-based manner, ~~characterized in that~~ the device being arranged to ~~comprises means for~~ perform~~ing~~ a spatial prediction for a block ~~(C)~~ to reduce ~~the~~an amount of information to be transmitted, wherein ~~at least one prediction method (P1-P13) has been defined, that~~ the device ~~further~~ comprises:

- ~~means for determining a classification for at least one~~a block classifier arranged to examine pixel values of a neighbouring block ~~(L, U)~~ of ~~said~~ a block ~~(C)~~ to be predicted to determine a classification for the neighbouring block according to the image contents of said neighbouring block ~~(L, U), and~~;

- ~~means~~a prediction method selector for selecting a prediction method ~~(P1-P13)~~ for the ~~current~~ block ~~(C)~~ to be predicted on the basis of ~~at least one~~ said classification; and

- a prediction estimator for forming a spatial prediction for the block to be predicted using the selected prediction method.

13. (Currently amended) A device according to Claim 12, ~~characterized in that~~wherein the ~~means for determining classification~~block classifier ~~comprises means for~~is arranged to determin~~ing~~e the classification for a neighbouring block on the basis of directionality ~~information~~in the image contents of the neighbouring block.

14. (Currently amended) A device according to Claim 13, ~~characterized in that~~wherein the ~~means for~~ block classifier is arranged to determin~~ing~~e the directionality ~~information~~in the image contents of the neighbouring block ~~comprises means for~~by calculating at least one gradient value (g_k) on the basis of pixel values of ~~said~~the neighbouring block.

15. (Currently amended) A device according to Claim 14, ~~characterized in that~~wherein the block classifier is arranged to calculate the gradient values (g_k) ~~have been calculated~~ with the following formula:

$$g_0 = \frac{1}{N(N-1)} \max\left(1, \sum_{y=0}^{N-1}\sum_{x=0}^{N-2} \left| I(x,y) - I(x+1,y) \right|\right)$$

$$g_1 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=1}^{N-1} \left| I(x,y) - \tfrac{1}{2}\left(I(x-1,y) + I(x-1,y+1)\right) \right|\right)$$

$$g_2 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=1}^{N-1} \left| I(x,y) - I(x-1,y+1) \right|\right)$$

$$g_3 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=1}^{N-1} \left| I(x,y) - \tfrac{1}{2}\left(I(x-1,y+1) + I(x,y+1)\right) \right|\right)$$

$$g_4 = \frac{1}{N(N-1)} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-1} \left| I(x,y) - I(x,y+1) \right|\right)$$

$$g_5 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-2} \left| I(x,y) - \tfrac{1}{2}\left(I(x,y+1) + I(x+1,y+1)\right) \right|\right)$$

$$g_6 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-2} \left| I(x,y) - I(x+1,y+1) \right|\right)$$

$$g_7 = \frac{1}{(N-1)^2} \max\left(1, \sum_{y=0}^{N-2}\sum_{x=0}^{N-2} \left| I(x,y) - \tfrac{1}{2}\left(I(x+1,y) + I(x+1,y+1)\right) \right|\right) \quad (1)$$

where N is the size of the neighbouring block, I(x,y) represent the pixel intensity values, indices x and y refer to coordinates of pixel inside the neighbouring block, and k represents edge orientations.

16. (Currently amended) A device according to Claim 15, ~~characterized in that~~wherein at least eight directionality classes (D0 - D7) ~~have been~~are defined for different edge orientations.

17. (Currently amended) A device according to Claim 12, ~~characterized in that~~wherein the classification comprises a

further 3 non-directional classes ~~(D8 – D10)~~ corresponding to flat, smooth texture and coarse texture blocks.

18. (Currently amended) A device according to Claim 12, ~~characterized in that~~further comprising a mapping unit arranged to define at least two context classes ~~(C0 – C6) have been defined, therein the device comprises means for~~and to perform~~ing~~ a mapping phase, in which the classification ~~information (D8 – D10)~~for a neighbouring block is ~~arranged to be~~ mapped into one of said context classes ~~(C0 – C6)~~.

19. (Currently amended) A device according to Claim 12, ~~characterized in that~~wherein the ~~device comprises means for~~block classifier is arranged to perform~~ing~~ a classification for at least two neighbouring blocks ~~(L, U)~~ of said block ~~(C)~~ to be predicted according to the image contents of said neighbouring blocks ~~(L, U)~~, the ~~means for~~mapping unit is arranged to defin~~ing~~e context classes ~~(C0 – C6)~~ for said neighbouring blocks ~~(L, U)~~, and ~~means for~~the prediction method selector is arranged to select~~ing~~ a prediction method ~~(P1 P13)~~ for the ~~current~~ block ~~(C)~~to be predicted on the basis of a combination of the defined context classes ~~(C0 – C6)~~.

20. (Currently amended) A device according to Claim 12, ~~characterized in that~~wherein ~~a cost function has been defined, wherein means for selecting a prediction method (P1 P13) comprises means for~~the prediction method selector is arranged to:

- calc~~u~~lat~~ing~~e a value of ~~the~~a cost function for at least two prediction methods~~,~~;
- ~~exploring~~examine the calculated cost function values to find~~ing~~ the minimum value, and
- select~~ing~~ the prediction method which produces said minimum value for the cost function.

device

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21. (Currently amended) A ~~method~~ according to Claim 20, ~~characterized in that~~wherein the cost function ~~has been~~is defined as:

$$Cx = D + \lambda R,$$

where cost Cx ~~has been~~is defined as a weighted sum of distortion D and rate R associated with each of the prediction methods and λ is the weighting factor.

22. (Currently amended) A device according to Claim 12, ~~characterized in that the device~~further comprise~~s~~ing means for defining a prediction error on the basis of ~~the~~a predicted~~ion~~ formed for block to be predicted and the real pixel values of said block ~~(C)~~to be predicted, means for coding the prediction error information, and means for transmitting the coded prediction error information.

23. (Currently amended) An encoder ~~(1) comprising means~~ for encoding a digital image~~, and means for dividing the digital image into blocks (C, L, U, UL, UR)~~, in a block-based manner, ~~characterized in that~~ the encoder ~~(1) comprises means for~~ being arranged to perform~~ing~~ a spatial prediction for a block ~~(C)~~ to reduce ~~the~~an amount of information to be transmitted, wherein ~~at least one prediction method (P1-P13) has been defined, that~~ the encoder ~~(1) further~~ comprises:

- ~~means for determining a classification for at least one~~a block classifier arranged to examine pixel values of a neighbouring block ~~(L, U)~~ of said block ~~(C)~~ to be predicted to determine a classification for the neighbouring block according to the image contents of said neighbouring block (L, U)~~, and~~;

- ~~means~~a prediction method selector for selecting a prediction method ~~(P1-P13)~~ for the ~~current~~ block ~~(C)~~ to be predicted on the basis of ~~at least one~~ said classification; and

- a prediction estimator for forming a spatial prediction for the block to be predicted using the selected prediction method.

24. (Currently amended) A decoder ~~(10) comprising means for~~ decoding a digital image~~, which is divided into blocks (C, L, U, UL, UR),~~ in a block-based manner, ~~characterized~~ in that the decoder ~~(10) comprises means for~~being arranged to ~~performing~~ a spatial prediction for a block ~~(C)~~ to reduce ~~the~~an amount of information to be transmitted, wherein ~~at least one prediction method (P1-P13) has been defined, that~~ the decoder ~~(10) further~~ comprises:

- ~~means for determining a classification for at least one~~a block classifier arranged to examine pixel values of a neighbouring block ~~(L, U)~~ of said block ~~(C)~~ to be predicted to determine a classification for the neighbouring block according to the image contents of said neighbouring block ~~(L, U), and~~;

- ~~means~~ a prediction method selector for selecting a prediction method ~~(P1-P13)~~ for the ~~current~~ block ~~(C)~~ to be predicted on the basis of ~~at least one~~ said classification; and

- a prediction estimator for forming a spatial prediction for the block to be predicted using the selected prediction method.

25. (Currently amended) A codec ~~(1, 10) comprising means~~ for encoding and decoding ~~a~~ digital images, ~~means for dividing the digital image into blocks (C, L, U, UL, UR),~~ in a block-based manner, ~~and means for decoding a digital image,~~

~~characterized in that~~ the codec ~~(1, 10) comprises means for~~being arranged to perform~~ing~~ a spatial prediction for a block ~~(C)~~ to reduce ~~the~~an amount of information to be transmitted, wherein ~~at least one prediction method (P1-P13) has been defined, that~~ the codec ~~(1, 10) further~~ comprises:

- ~~means for determining a classification for at least one~~a block classifier arranged to examine pixel values of a neighbouring block ~~(L, U)~~ of said block ~~(C)~~ to be predicted to determine a classification for the neighbouring block according to the image contents of said neighbouring block ~~(L, U), and~~;
- ~~means~~a prediction method selector for selecting a prediction method ~~(P1-P13)~~ for the ~~current~~ block ~~(C)~~ to be predicted on the basis of ~~at least one~~ said classification; and
- a prediction estimator for forming a spatial prediction for the block to be predicted using the selected prediction method.

26. (Currently amended) A mobile terminal ~~(24)~~ comprising an encoder according to Claim 23. ~~means for encoding a digital image, means for dividing the digital image into blocks (C, L, U, UL, UR), and means for decoding a digital image, characterized in that the mobile terminal (24) comprises means for performing spatial prediction for a block (C) to reduce the amount of information to be transmitted, wherein at least one prediction method (P1-P13) has been defined, that the mobile terminal (24) further comprises means for determining a classification for at least one neighbouring block (L, U) of said block (C) to be predicted according to the contents of said neighbouring block (L, U), and means for selecting a prediction method (P1-P13) for the current block (C) on the basis of at least one said classification.~~

27. (Currently amended) A storage medium for storing a software program comprising machine executable steps for performing the method according to Claim 1. ~~encoding a digital image, and for dividing the digital image into blocks (C, L, U, UL, UR), characterized in that the software program further comprises machine executable steps for performing spatial prediction for a block (C) to reduce the amount of information to be transmitted, wherein at least one prediction method (P1-P13) has been defined, steps for determining a classification for at least one neighbouring block (L, U) of said block (C) to be predicted according to the contents of said neighbouring block (L, U), and steps for selecting a prediction method (P1-P13) for the current block (C) on the basis of at least one said classification.~~

28. (New) A method according to Claim 1, comprising determining a classification for more than one neighbouring block of said block to be predicted and selecting a prediction method for said block to be predicted on the basis of the classifications for said more than one neighbouring block.

29. (New) A method according to Claim 1, wherein the selected prediction method extends image details having a certain directionality into the block to predicted.

30. (New) A method according to Claim 1, wherein said classification is representative of the directionality of the image contents of said neighbouring block.

31. (New) A method according to Claim 30, further comprising combining classifications representative of similar directionalities to form context classes representative of said similar directionalities.

32. (New) A method according to Claim 1, comprising:
- determining a classification for at least two neighbouring blocks of said block to be predicted according to the image contents of said neighbouring blocks; and
- selecting a sub-set of prediction methods from a set of available prediction methods on the basis of a combination of the classifications of said at least two neighbouring blocks.

33. (New) A method according to Claim 32, further comprising:
- selecting a prediction method for the block to be predicted from said sub-set of prediction methods on the basis of the classifications of said at least two neighbouring blocks; and
- forming a spatial prediction for the block to be predicted using the selected prediction method.

34. (New) A method according to Claim 33, further comprising providing a signal indicative of the selected prediction method.

35. (New) A method according to Claim 33, comprising calculating a cost function representative of an error incurred when using a particular prediction method to form a spatial prediction for the block to be predicted and selecting the prediction method for the block to be predicted from said sub-set of prediction methods that yields the smallest value for the cost function.

36. (New) A method according to claim 35, wherein the cost function includes a measure of an error incurred when using a particular prediction method to form a spatial prediction for the block to be predicted and a measure of an amount of information required to be transmitted to a corresponding decoder when said particular prediction method is selected.

37. (New) A method for decoding a digital image in a block-based manner, in which a spatial prediction for a block is performed to reduce an amount of information to be transmitted, wherein the method comprises:
- examining pixel values of a neighbouring block of a block to be predicted to determine a classification for the neighbouring block according to the image contents of said neighbouring block;
- selecting a prediction method to be used in forming a spatial prediction for the block to be predicted on the basis of said classification; and
- forming a spatial prediction for the block to be predicted using the selected prediction method.

38. (New) A method according to Claim 37, wherein the classification for a neighbouring block is determined on the basis of directionality in the image contents of the neighbouring block.

39. (New) A method according to Claim 37, comprising determining a classification for more than one neighbouring block of said block to be predicted and selecting a prediction method for said block to be predicted on the basis of the classifications for said more than one neighbouring block.

40. (New) A method according to Claim 37, wherein the selected prediction method extends image details having a certain directionality into the block to predicted.

41. (New) A method according to Claim 37, comprising:
- determining a classification for at least two neighbouring blocks of said block to be predicted according to the image contents of said neighbouring blocks; and

- selecting a sub-set of prediction methods from a set of available prediction methods on the basis of a combination of the classifications of said at least two neighbouring blocks.

42. (New) A method according to Claim 41, further comprising:
- receiving a signal indicative of a prediction method in said sub-set of prediction methods;
- selecting a prediction method for the block to be predicted from said sub-set of prediction methods responsive to said received signal; and
- forming a spatial prediction for the block to be predicted using the selected prediction method.

43. (New) An encoder according to Claim 23, wherein the block classifier is arranged to determine the classification for a neighbouring block on the basis of directionality in the image contents of the neighbouring block.

44. (New) An encoder according to Claim 23, wherein the block classifier is arranged to determine a classification for more than one neighbouring block of said block to be predicted and to select a prediction method for said block to be predicted on the basis of the classifications for said more than one neighbouring block.

45. (New) An encoder according to Claim 23, wherein the prediction estimator is arranged to form a spatial prediction for the block to be predicted by extending image details having a certain directionality into the block to predicted.

46. (New) An encoder according to Claim 23, wherein said classification is representative of the directionality of the image contents of said neighbouring block.

47. (New) An encoder according to Claim 46, wherein the block classifier is arranged to combine classifications representative of similar directionalities to form context classes representative of said similar directionalities.

48. (New) An encoder according to Claim 23, wherein the block classifier is arranged to determine a classification for at least two neighbouring blocks of said block to be predicted according to the image contents of said neighbouring blocks and the prediction method selector is arranged to select a sub-set of prediction methods from a set of available prediction methods on the basis of a combination of the classifications of said at least two neighbouring blocks.

49. (New) An encoder according to Claim 48, wherein the prediction method selector is arranged to select a prediction method for the block to be predicted from said sub-set of prediction methods on the basis of the classifications of said at least two neighbouring blocks and the prediction estimator is arranged to form a spatial prediction for the block to be predicted using the selected prediction method.

50. (New) An encoder according to Claim 49, further arranged to provide a signal indicative of the selected prediction method.

51. (New) An encoder according to Claim 49, comprising a cost function calculator for calculating a cost function representative of an error incurred when using a particular prediction method to form a spatial prediction for the block to be predicted and the prediction method selector is arranged to select the prediction method for the block to be predicted from said sub-set of prediction methods that yields the smallest value for the cost function.

52. (New) An encoder according to claim 51, wherein the cost function includes a measure of an error incurred when using a particular prediction method to form a spatial prediction for the block to be predicted and a measure of an amount of information required to be transmitted to a corresponding decoder when said particular prediction method is selected.

53. (New) A decoder according to Claim 24, wherein the block classifier is arranged to determine the classification for a neighbouring block on the basis of directionality in the image contents of the neighbouring block.

54. (New) A decoder according to Claim 24, wherein the block classifier is arranged to determine a classification for more than one neighbouring block of said block to be predicted and to select a prediction method for said block to be predicted on the basis of the classifications for said more than one neighbouring block.

55. (New) A decoder according to Claim 24, wherein the prediction estimator is arranged to form a spatial prediction for the block to be predicted by extending image details having a certain directionality into the block to predicted.

56. (New) A decoder according to Claim 24, wherein the block classifier is arranged to determine a classification for at least two neighbouring blocks of said block to be predicted according to the image contents of said neighbouring blocks and the prediction method selector is arranged to select a sub-set of prediction methods from a set of available prediction methods on the basis of a combination of the classifications of said at least two neighbouring blocks.

57. (New) A decoder according to Claim 56, further arranged to receive a signal indicative of a prediction method in said sub-set of prediction methods wherein said prediction method selector is arranged to select a prediction method for the block to be predicted from said sub-set of prediction methods responsive to said received signal.

58. (New) A mobile terminal comprising a decoder according to Claim 24.

59. (New) A storage medium for storing a software program comprising machine executable steps for performing the method according to Claim 28.